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Demand Response Solutions In Connecticut

Presentation to SIPRAC

September 14, 2006

Agenda

- Background
- What is Demand Response?
- EnerNOC Overview
- EnerNOC Examples and Experience
- Demand Response in Connecticut
- Contact Information

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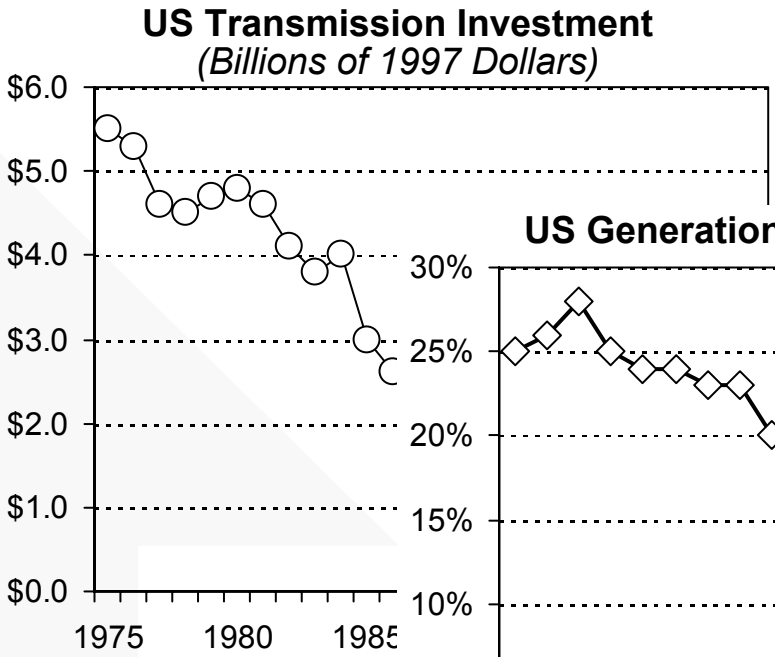
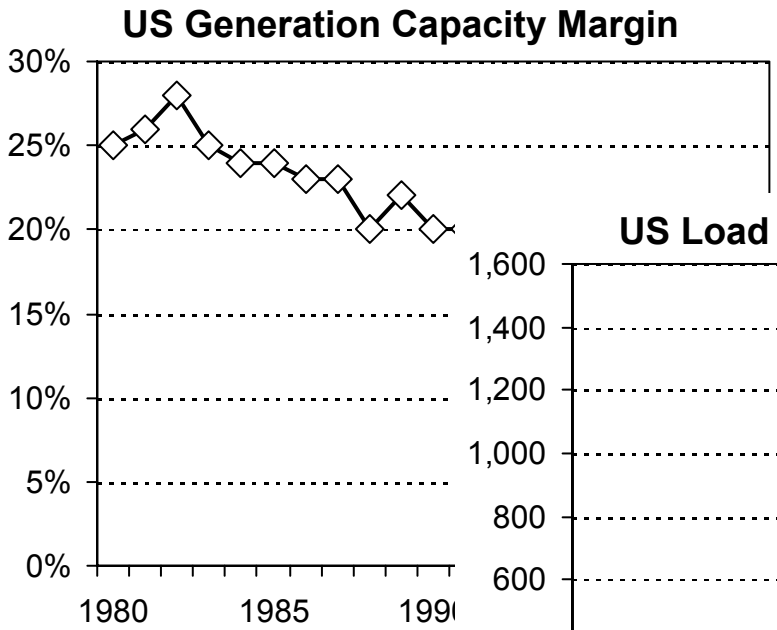
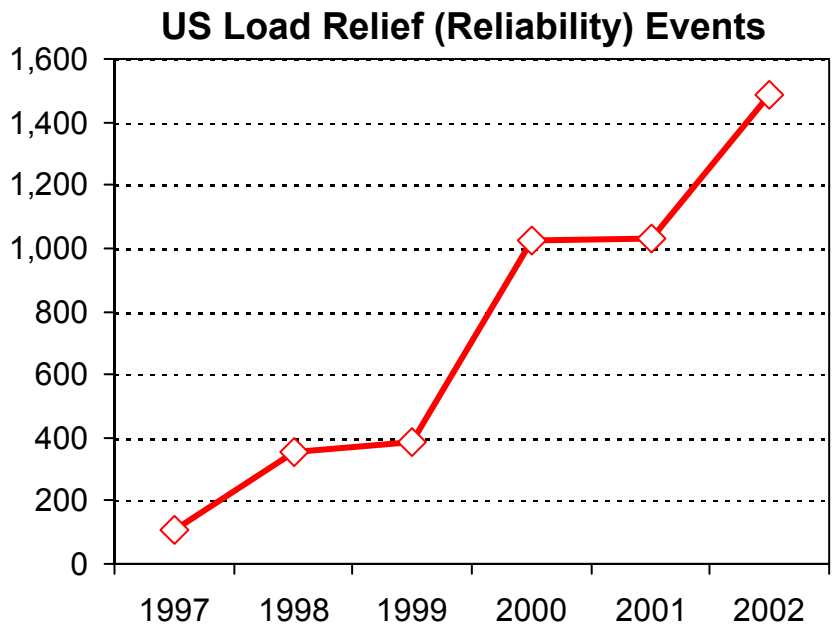
Background

The continued decline in generation and transmission investment brings a decline in reliability.







Source: Electric Perspectives, July/August 2001, Western States Power Crises White Paper, ERPI, Summer 2001.

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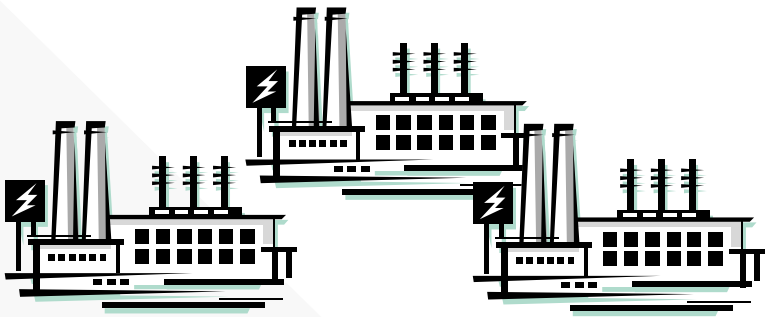
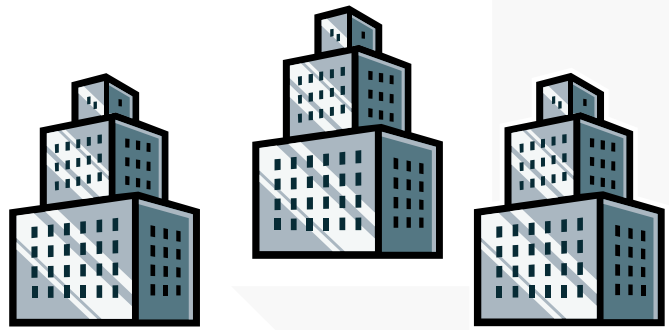
Background

Grid operators must meet the demand of a control area's aggregated load while meeting FERC's reliability standard of downtime of no more than one day in ten years!

Supply = **Demand**



Plant 1's Capacity + Plant 2's Capacity + Plant 3's Capacity



Your Building's Demand + Next Building's Demand + Next Building's Demand

If Load Increases . . .

1

- Build generator
- Build generator
- Build generator

2

- Consume less
- Curtail during critical peaks
- Shift consumption

Significant Societal Benefits from Demand Side Management!!!

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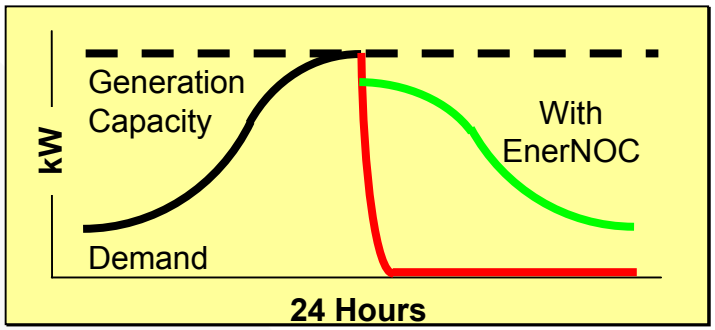
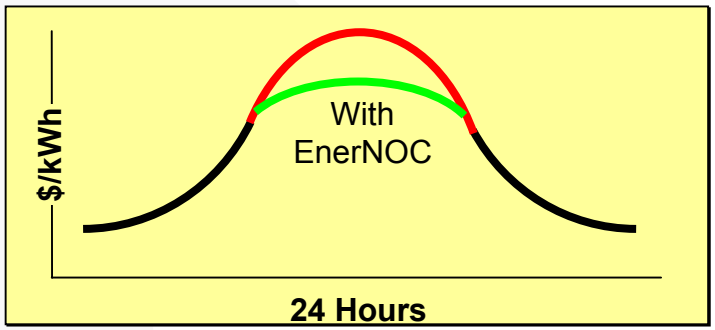
What is Demand Response?

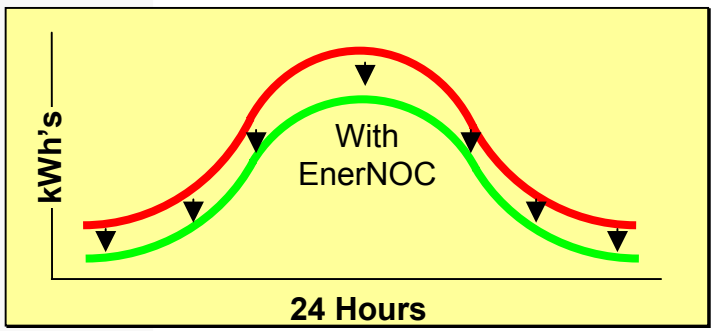
Demand response is achieved when end-users reduce their demand for electricity from the grid in response to market signals.



Reliability/Security – DR can be brought to market more quickly and precisely than comparable generation or T&D, giving grid operators resources needed to better manage reliability NOW while paying end-users to tap into existing resources.



Price – DR can dramatically reduce pricing power of well-positioned generators and incentivizes end users to become active participants in energy markets – active participation keeps markets healthy and prices low.



Efficiency – Demand response raises the specter of efficiency. Increased end user market participation puts energy back on the business planner's map and, when properly deployed, can save end-users 25% or more on energy bills.

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What is Demand Response?

Demand response actions come in two basic forms.

Curtailment – Turning off lights, turning up cooling set-points, turning off air handlers, shifting production schedules, escalators, elevators, water features, parking lights, signage, heating elements, etc.

Self Generation – This can include emergency/backup generation, peaking and continuous-duty distributed generation, or even UPS systems.

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What is Demand Response?

Demand response can be accomplished manually or automatically (i.e., remotely controlled).

Manual – Personnel receive an EnerNOC phone call, email, and/or page and respond to an event, shutting down devices, turning up set points, and turning on generation.

Automatic –EnerNOC remotely controls relays, ATS's, and building management systems en masse to reduce demand or self-generate.

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About EnerNOC

Founded in 2001, EnerNOC is a technology-enabled, C&I-focused demand response solutions provider.

- ***Proven and growing track record*** – Nearly 400 MW's of demand response capacity from 800 customer sites with peak load of over 1,000 MW
- ***Compelling offering*** – Full service demand response solutions provider – research, education, permitting, financing, metering, aggregation, enrollment, installation, data and payment reconciliation, maintenance – remove complexity; technology and services platform for comprehensive energy management solutions
- ***Certified provider*** – Certified to provide demand response services in every open demand response market in the US
- ***Distinguished technology*** – Provide 24/7, real-time metering and web-based device monitoring and control through open architecture technology that leverages customers existing assets
- ***Significant resources***
  - ***Human capital*** – Deep team experience in energy and technology management – 85 employees with more than 140 engineering and management degrees
  - ***Financial*** – Strong balance sheet and impressive financial track record

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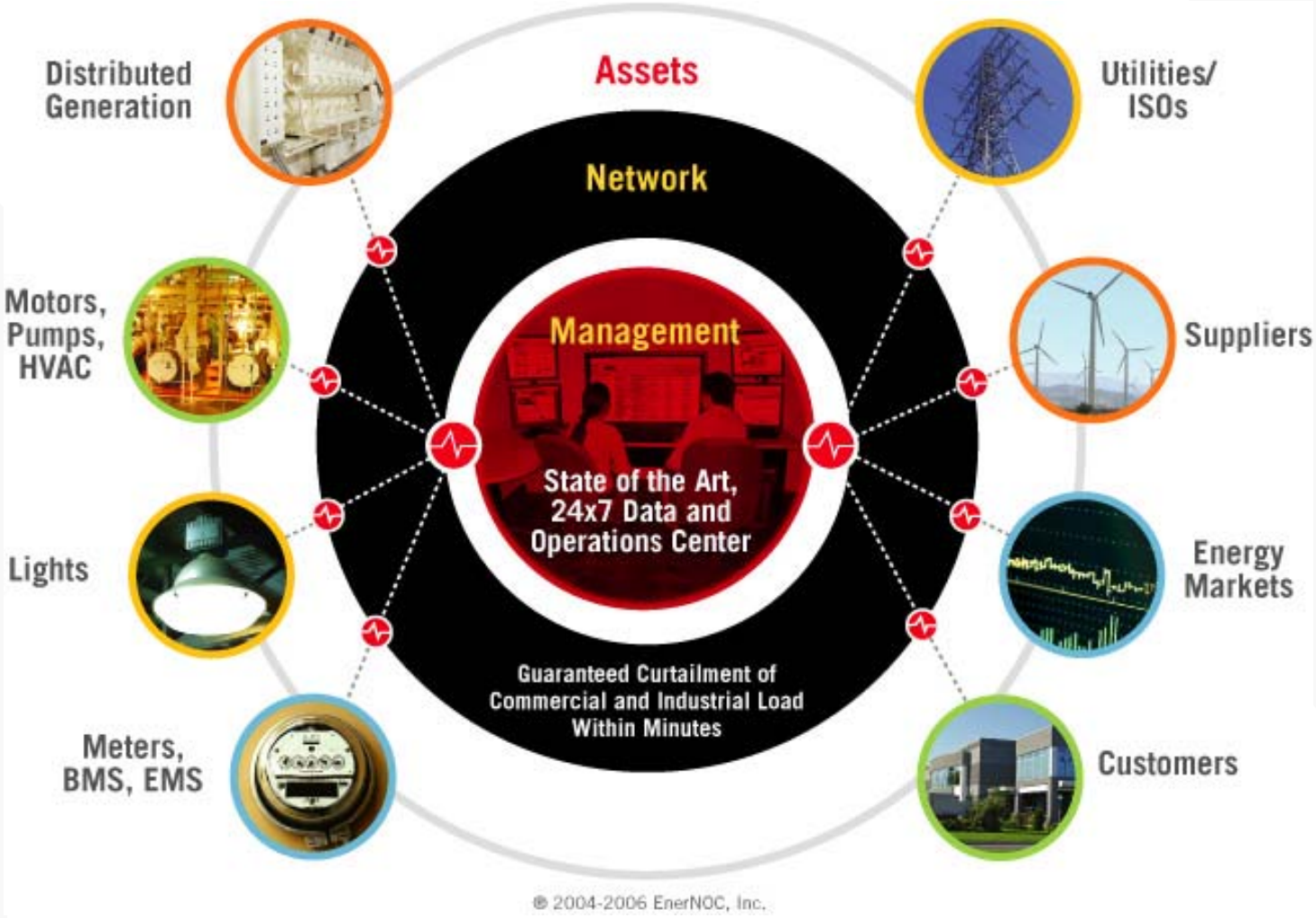
The Energy Network Operations Center

EnerNOC enables existing assets with inexpensive, scalable technology to accomplish significant and guaranteed reductions in demand.



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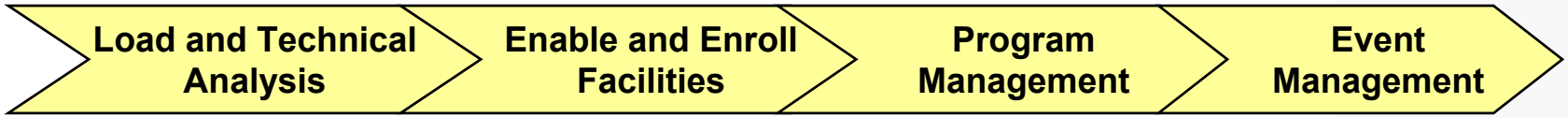
EnerNOC Overview

EnerNOC's offering is a completely outsourced solution. The complexities of participating in the program are entirely simplified.



- Conduct facility walk-through
  - Identify curtailable loads
  - Identify backup generator potential
  - Identify existing metering systems to integrate and save money
- Interview facility engineering and operations staff to identify customer sensitivities
- Develop technical solution options
- Summarize load analysis, present options for load control and program involvement, and present economic potential

- Design technical solution
- Procure required technology (e.g., metering, relays, controls)
- Install (or integrate with existing) metering, controls, and communication
- Test and troubleshoot technical solution
- Initiate monitoring and begin metering loads
- Apply for, administer, and secure eligible cost reimbursements
- Register as customer's Responsible Interface Party (RIP)
- Aggregate customer loads as applicable
- Enroll assets into each DR program

- Begin collecting data
- Research, file, and renew all required city and state permits for program participation
- Maintain all required records
- Enroll load in daily/monthly markets to maximize potential benefit while minimizing risk
- Present real-time meter data to ISO for verification and to customer for reporting
- Monitor loads continuously and adjust enrollments accordingly
- Reconcile data with ISO monthly and collect and disburse program payments
- Manage any program disputes and changes for customer

- Notify customers in advance of potential events
- Notify customers during day of event of event "window" and requirements
- Curtail load/initiate backup generator operation as required
- Monitor, meter, and adjust performance according to enrolled load
- Notify customers of event completion and restore normal operations
- Provide event and load reports accordingly
- Continually ensure operational integrity of technical solution

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EnerNOC Target Customer Segments

EnerNOC's rapid success is based on the value we have delivered to our customers through demand response and energy management solutions.

Commercial Office and High Tech	SBC, The Hartford, Pitney Bowes, Konica Minolta, Level 3 Communications, GE, AT&T, Adobe
Education	Western Connecticut State University, Adelphi University, Babson, Olin College, MIT, Fairfield University, Tufts University, Southern Connecticut State University
Food Sales and Storage	Pathmark, Hannaford, ShopRite, Albertsons, Stop & Shop, Raley's Family of Fine Stores, Whole Foods Market, Price Chopper
Government	Stamford, Southington, Lowell, Meriden Center of Opportunity, Fairfield, Riverhead, Long Beach, Trumbull, Norwalk, Danbury
Healthcare	Stamford Health System, Greenwich Hospital Yale New Haven Health, Bradley Memorial Hospital, Hall-Brooke Behavioral Health Services, Danbury Hospital A Difference That Matters, Partners HealthCare, Apple Health Care Incorporated
Light Industrial	Boehringer Ingelheim, Spartech, Pfizer, Rubino Brothers Inc., Estée Lauder, Vermont Castings, Valley, B&H Aircraft Co., Inc.
Lodging and Resorts	Westin Hotels & Resorts, Marriott Hotels & Resorts, Sheraton Hotels & Resorts, Hampton Inn & Suites, Wingate Inn, The New Yorker Hotel, Hilton

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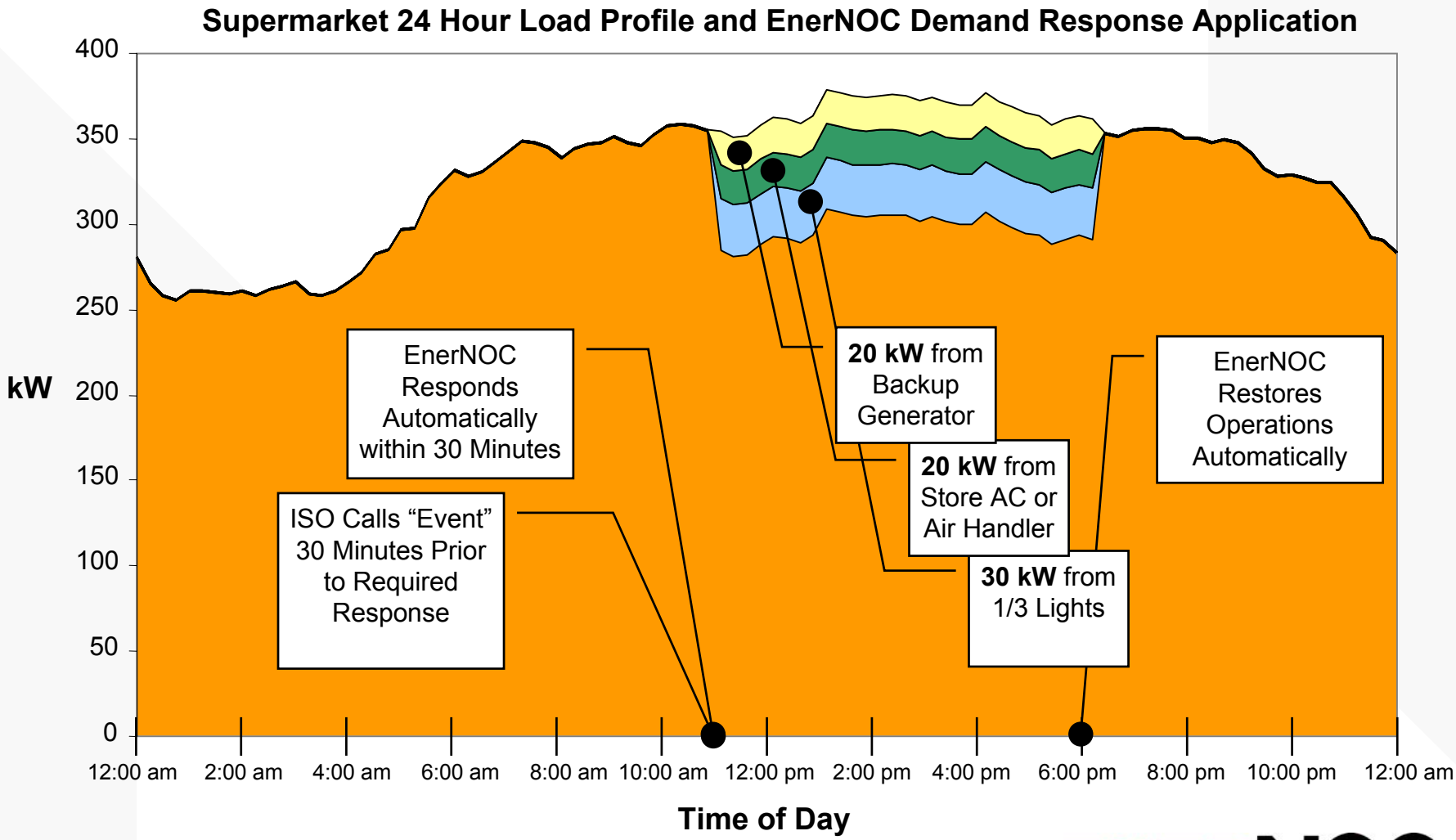
EnerNOC Examples and Experience

An industry-specific solution should always be deployed to maximize the demand response opportunity.



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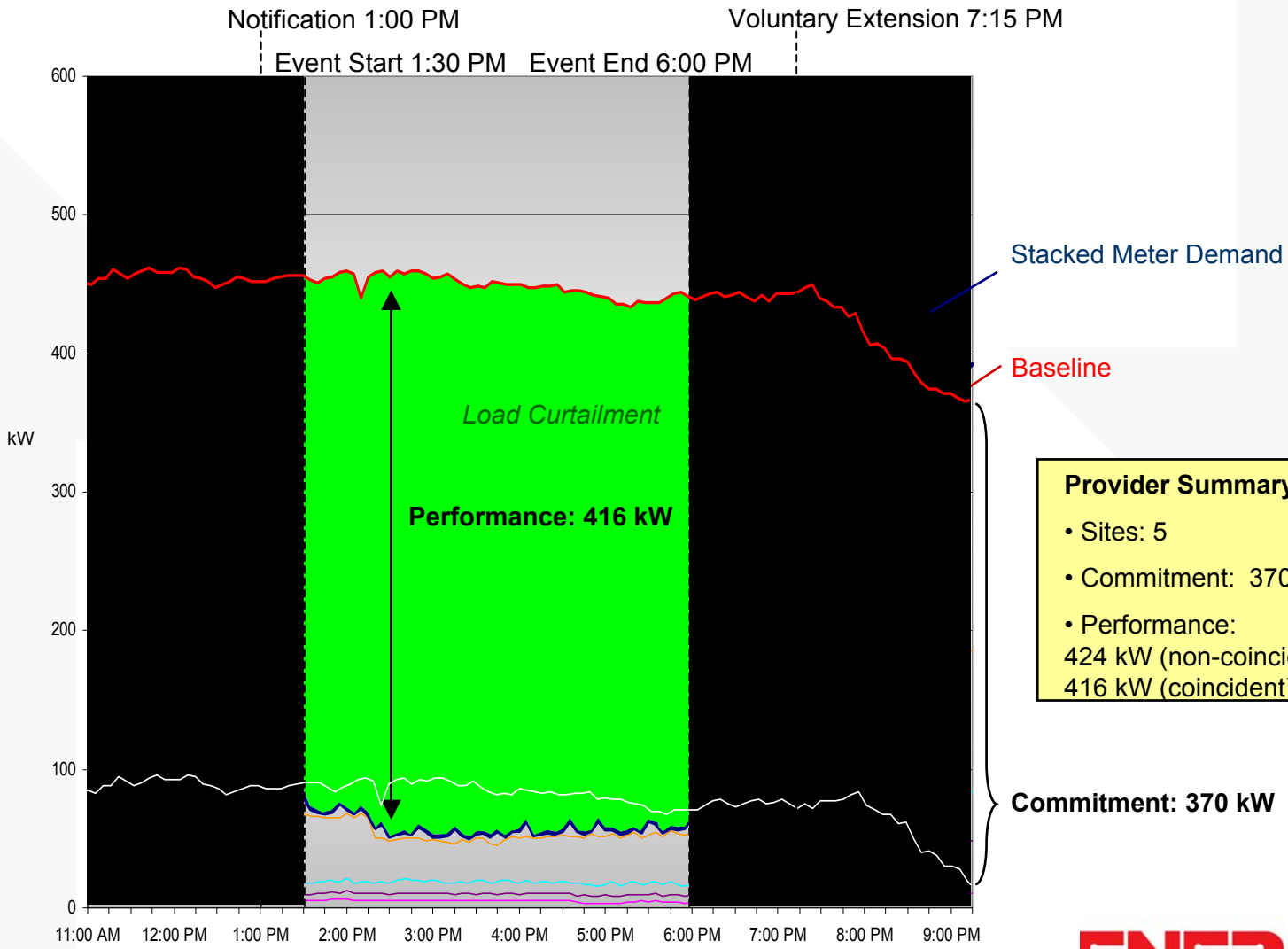
Demand Response Event Summary

University provider curtails more than 400 kW of load at five individual sites.

New York and New England – July 27, 2005



Provider Summary

- Sites: 5
- Commitment: 370 kW
- Performance:
  424 kW (non-coincident)
  416 kW (coincident)

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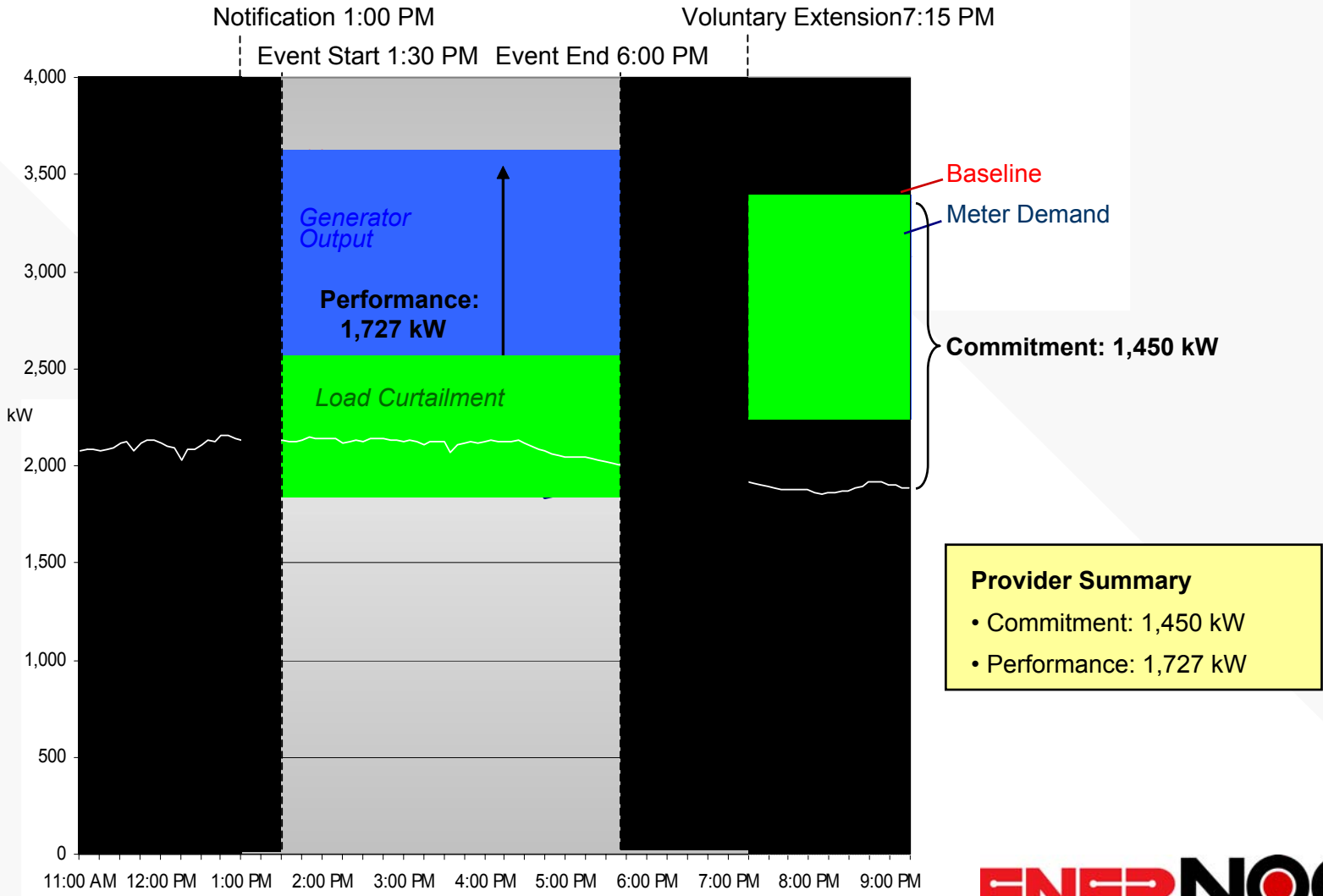
Demand Response Event Summary

University provider combines generation with load curtailment to reduce more than 1.7 MW from the electrical grid.

New York and New England – July 27, 2005



Provider Summary

- Commitment: 1,450 kW
- Performance: 1,727 kW

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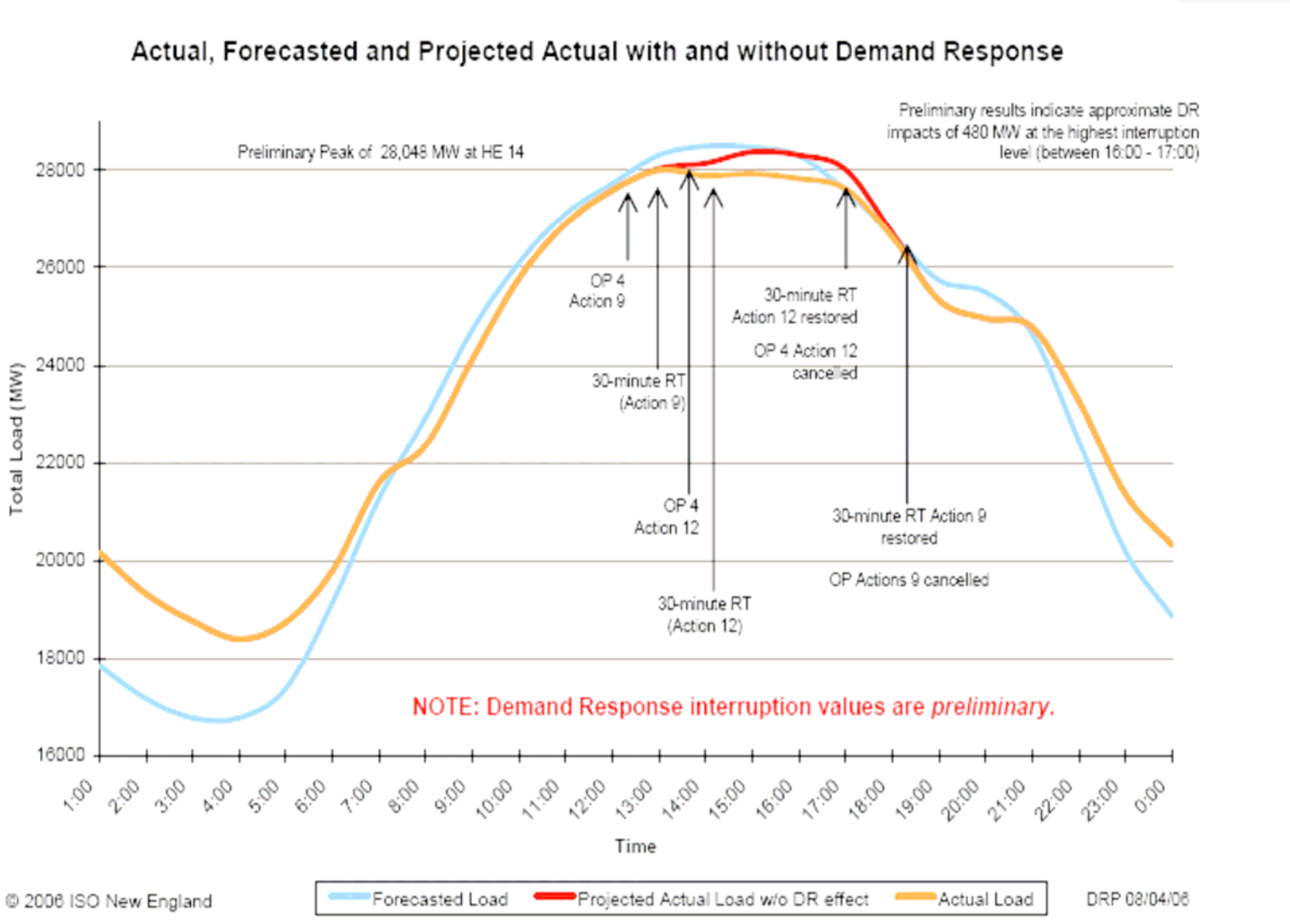
ISO NE Experience on August 2, 2006



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EnerNOC Examples and Experience

Valley Container, a Bridgeport-based manufacturer of corrugated boxes and containers, participates in demand response using an EnerNOC-owned backup generator.

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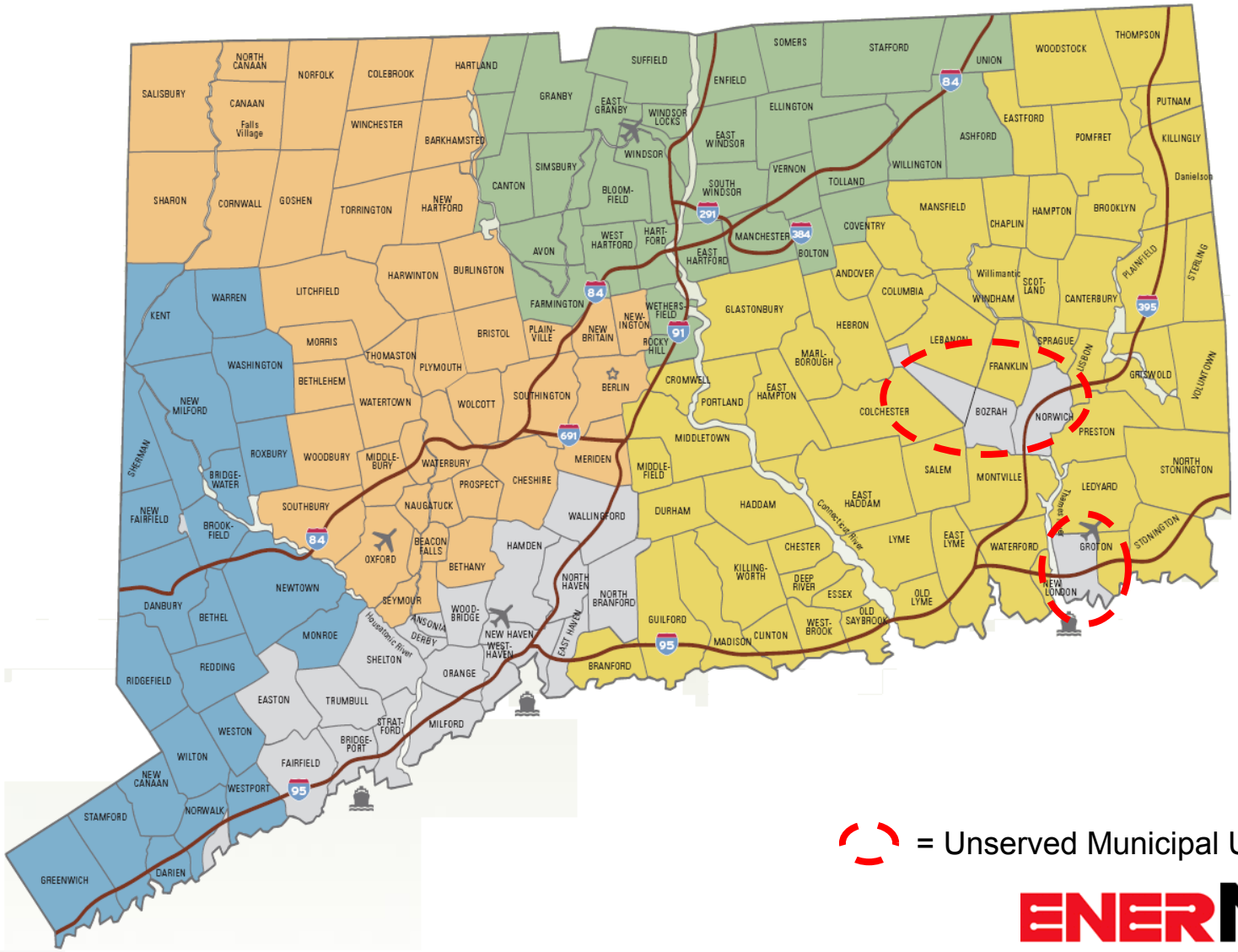
Demand Response in Connecticut

EnerNOC serves commercial, institutional, and industrial customers throughout Connecticut, with the exception of certain municipal utility districts.



Demand Response in Connecticut

EnerNOC offers two distinct programs to meet customer needs.

1 Enable Existing Capacity

- Pay customers monthly to be able to either curtail power or run an existing generator
- Term is from now through either December 31, 2008 or May 31, 2009
- Customers receive capacity payments as well as energy payments during events
- Customers pay no penalties for non-participation – there is NO risk
- Payments made on a quarterly basis
- No initial set up or installation costs
- EnerNOC provides complete end to end solution from site audit to equipment installation to permitting and capacity management. Customer provides local area network

2 Install New Capacity

- EnerNOC designs, installs, commissions, fuels, and maintains new "whole facility" backup generator – must be installed by January 1, 2007
- Customer must participate in 30 minute real-time demand response program during 10-year term of agreement to help maintain grid reliability
- EnerNOC accesses CT $200/kW capital grants on behalf of customer and pays roughly $200/kW differential to complete project
- EnerNOC collects all market revenues associated with demand response
- EnerNOC manages customer's participation in demand response programs during entire term

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Demand Response in Connecticut

30 Minute, Real-Time Demand Response Program Details

- Customers must be able to respond within 30 minutes of an ISO-NE emergency demand response event
- Events can be called during business days (excluding national holidays) between 7:00 a.m. and 6:00 p.m.
- Only three “OP 4, Action 12” events have been called in the past – August 14th, 2003; July 27th, 2005; and August 2, 2006. An “audit” is guaranteed to be called each year after August 15th if no actual events occur
- End user earns capacity payment every month for making resource “available” regardless of whether an event is called
- EnerNOC provides the Internet-Based Communication System required for resources to participate 30-minute emergency DR program
- Preferable for customer to provide local area network (LAN) access; EnerNOC can provide broadband wireless if LAN is not available

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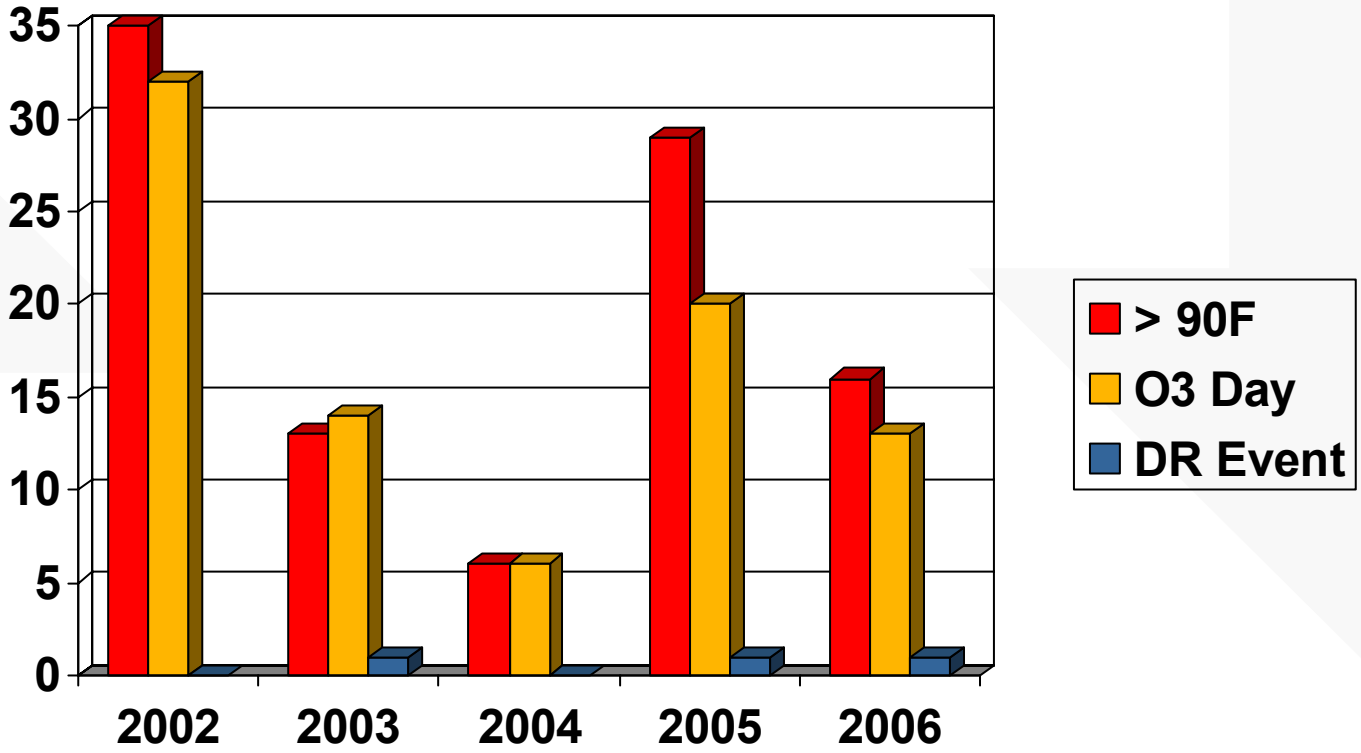
Demand Response in Connecticut



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Demand Response in Connecticut

ISO-NE Control Overview

- ISO-NE balances supply and demand on a continuous basis, and is responsible for maintaining the reliability of the entire New England electrical grid
- Load growth in Connecticut has exceeded capacity of local generation and transmission, creating a “reliability gap”
- ISO-NE has a clear control procedure for periods of time when available resources are insufficient to meet anticipated loads plus Operating Reserve Requirements, known as Operating Procedure No. 4: Action During a Capacity Deficiency
- In actions 1-11 of OP 4, ISO-NE implements a power caution, begins to allow depletion of the 30-minute reserve, purchases all available capacity and energy from Participants and neighboring Control Areas, and calls on all demand resources that either require 2 hours notice or can reduce load within 30 minutes without using emergency generation
- **If actions 1-11 are not sufficient, ISO-NE implements action 12, a voltage reduction of 5% below normal voltage (i.e., brownouts), effectively increasing the amperage available to serve load, and calls on all 30-minute demand response resources that use emergency generators**
- If all other actions are exhausted, ISO-NE begins to implement involuntary load shedding (i.e., rolling blackouts) until the remainder of the grid is stabilized15

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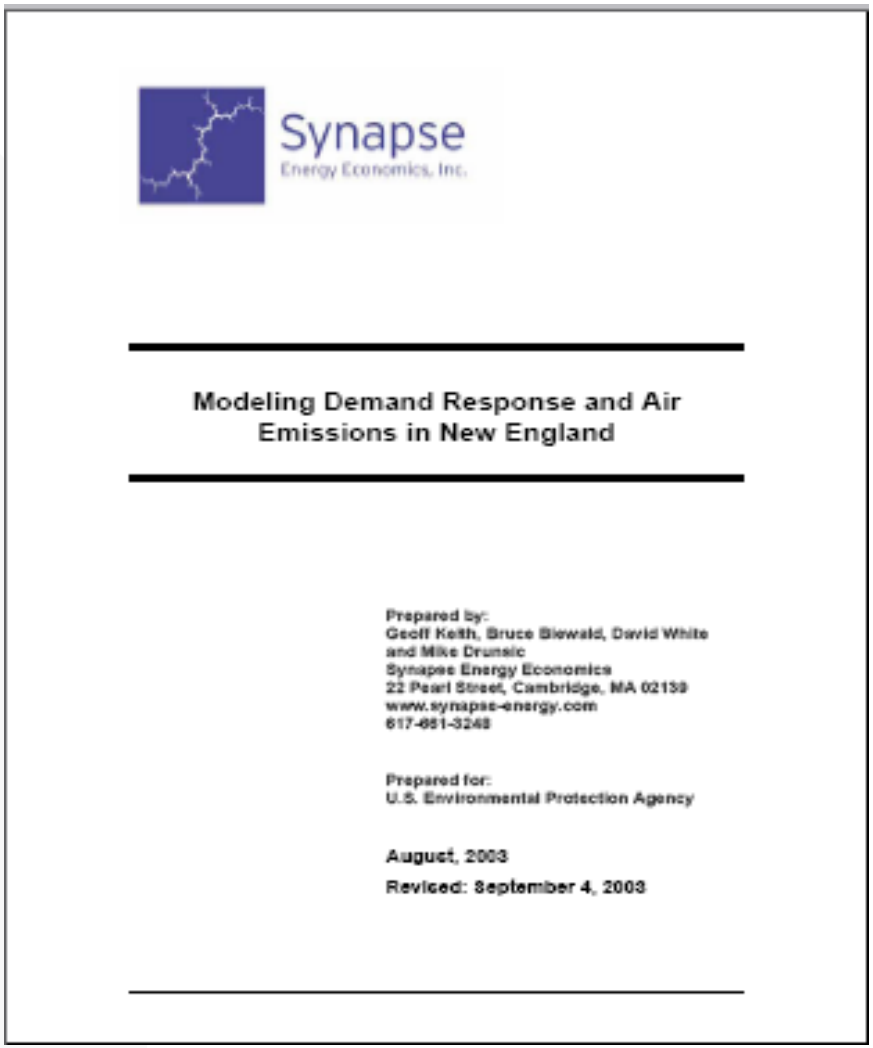
Demand Response in Connecticut



Synapse
Energy Economics, Inc.

Modeling Demand Response and Air Emissions in New England

Prepared by:
Geoff Keith, Bruce Biewald, David White and Mike Drunsic
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Prepared for:
U.S. Environmental Protection Agency

August, 2003
Revised: September 4, 2003

- "When the DR resource is used to meet reserve requirements, the result is more efficient unit commitment, reduced operation of oil- and gas-fired steam units and increased operation of combined-cycle units in New England."
- Even assuming all DR is from diesel-fired generators, the report shows a net benefit in air quality.
- "New England has a small amount of quick-start capacity relative to the regional peak load compared to most other control areas. Many analysts have noted that this requires large power plants to operate more than they would otherwise have to in order to maintain sufficient operating reserves – capacity that can be provided quickly in response to unplanned losses of capacity."

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Demand Response in Connecticut

Additional Points

- Emergency DR should not be confused with economic DR
- Record peak demand does not always mean a DR event (e.g., 27,395 MW peak on July 18, 2006 did not trigger OP 4, Action 12)
- DPUC Grant Program will not affect the number of times ISO declares OP 4, Action 12
- “Demand response programs, particularly those that can qualify for operating reserve, have an opportunity to play an important role in meeting the capacity requirements identified” CEAB (2006)
- The Connecticut Siting Council’s Review of the Ten-Year Forecast of Connecticut Electric Loads and Resources 2005-2014 noted that emergency generators and DR programs were critical elements to address the capacity shortfalls in Southwest Connecticut
- If the grid fails, every emergency generator in the state will operate for an extended period of time

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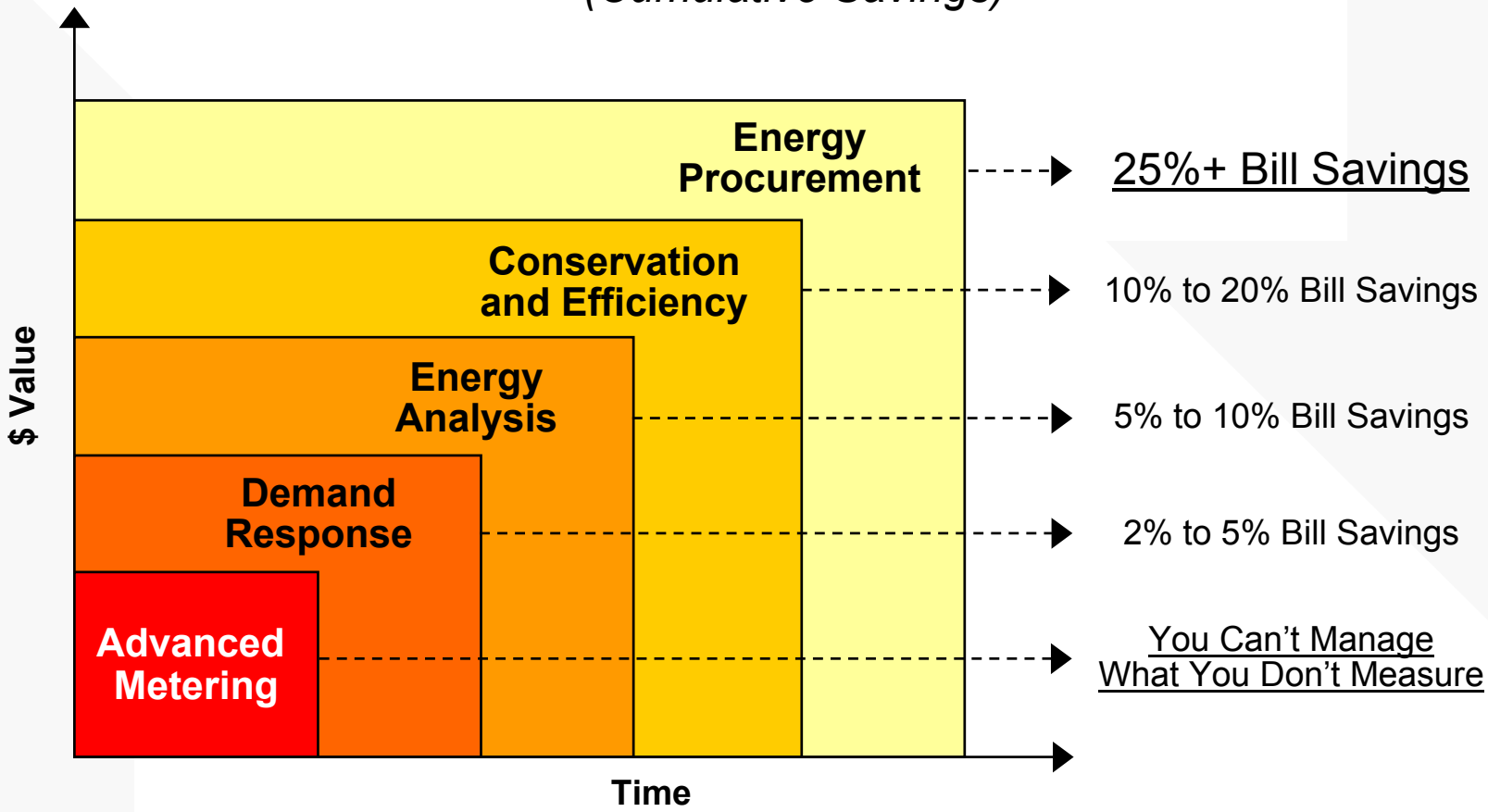
Demand Response Leads to Better Energy Management

EnerNOC's strategy is to serve customers with a technology-enabled, total energy management solution that optimizes energy usage and minimizes energy costs.

Total Energy Management with EnerNOC
(Cumulative Savings)



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